# UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 4992

CSAH NO. 4

OVER THE

CLEARWATER RIVER (DAM)

DISTRICT 2 - CLEARWATER COUNTY


PREPARED FOR THE

MINNESOTA DEPARTMENT OF TRANSPORTATION

BY

COLLINS ENGINEERS, INC.

JOB NO. 3512 (CEI 36)

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 4992, Pier 1 and the North and South Abutments, were found to be in satisfactory (South Abutment) to fair (North Abutment and Pier 1) condition with some defects of minor structural significance. The concrete deterioration at the abutments and the pier has progressed since the previous inspection, but overall, has still not appreciably compromised the substructure's structural integrity. The channel bottom up and downstream of the bridge is well established and stable with no evidence of significant scour and no appreciable changes since the previous inspection.

INSPECTION FINDINGS:

(A) The previous concrete repair was failing at the North Abutment and along both sides of Pier 1 in a horizontal band typically between the waterline and 4 feet above, with typical penetrations of 1 to 2 inches, maximum penetrations of 4 inches, and some exposed reinforcing steel.

(B) The previous concrete repair at the South Abutment was in satisfactory condition with 1/16 inch to 1/8 inch of surface delaminations present.

(C) A vertical 1/8 inch wide crack and a diagonal 1/16 inch wide crack were observed on both sides of Pier 1 extending from the failed concrete repair up to the pier top.

(D) Below water (below the failed concrete repair as described in A), the concrete of the substructure units and dam surfaces exhibited only light scaling.

(E) Both downstream wingwalls exhibited additional cracking and deterioration since the last inspection.

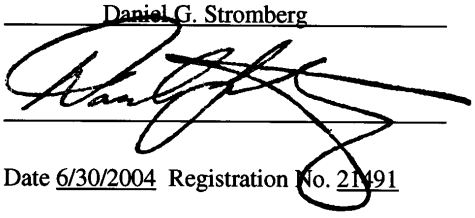
RECOMMENDATIONS:

(A) Although the present extent of substructure deterioration has yet to significantly compromise structural integrity, the deterioration has and will continue to progress. If long-term serviceability is desired for the structure, consideration should be given to removing all unsound original concrete and repair materials, and restoring the concrete surfaces by patching and recasting with a concrete mix of high durability and low permeability. In addition, the crack on both sides of Pier 1 and the cracks in the downstream wingwalls should be repaired by epoxy injection.

(B) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

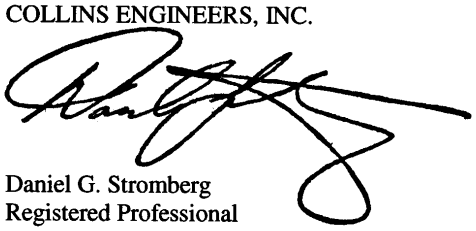
Daniel G. Stromberg



Date 6/30/2004 Registration No. 21491

Respectfully submitted,

COLLINS ENGINEERS, INC.



Daniel G. Stromberg
Registered Professional
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 4992

Feature Crossed: The Clearwater River (Dam)

Feature Carried: CSAH No. 4

Location: District 2 - Clearwater County

Bridge Description: The superstructure consists of two spans of multiple steel beams. The superstructure is supported by two reinforced concrete abutments and one reinforced concrete pier. The bridge was built as an integral part of a concrete dam. Both the dam and the substructure units are founded on a spread footing/apron slab which extends under the entire bridge.

2. INSPECTION DATA

Professional Engineer Diver: Daniel G. Stromberg
State of Minnesota, P.E., No. 21491

Dive Team: Michelle D. Koerbel, Matthew J. Lengyel

Date: August 26, 2002

Weather Conditions: Sunny, ± 80$^{o}$ F

Underwater Visibility: ± 3.0 Feet

Waterway Velocity: Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: North and South Abutments and Pier 1

General Shape: The abutments each consist of a transverse breast wall and two skewed wingwalls. The pier consists of an oblong rectangular shaft.

Maximum Water Depth at Substructure Inspected: Approximately 8.0 Feet (upstream), and 1.5 Feet (downstream).

4. WATERLINE DATUM

Water Level Reference: Top of the curb at the east and west ends of Pier 1.

Water Surface: The upper pool was 6.3 feet below reference.
Upper Pool Elevation = 98.2.
The lower pool was 19.4 feet below reference.
Lower Pool Elevation = 85.1.

5. NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)

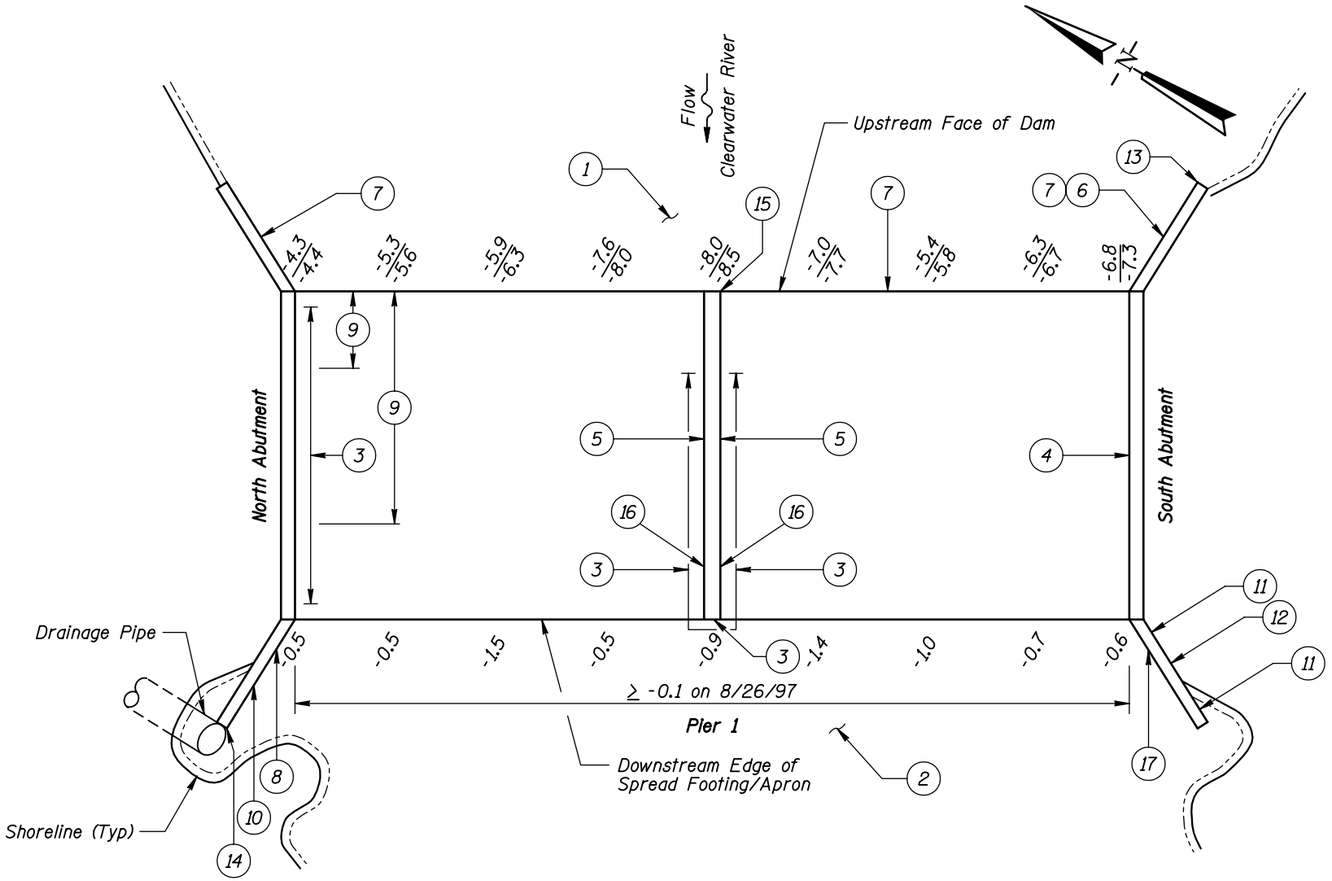
Item 60: Substructure: Code 5

Item 61: Channel and Channel Protection: Code 8

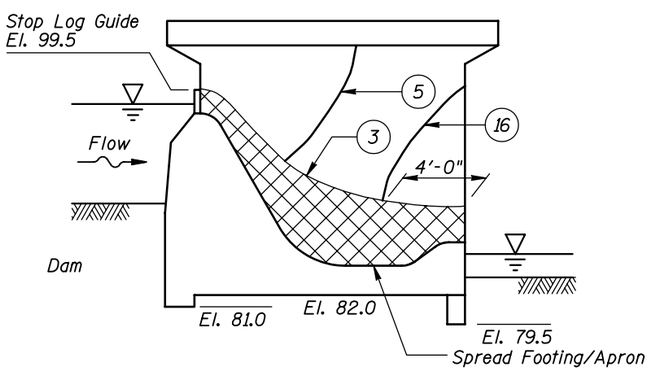
Item 92B: Underwater Inspection: Code B/08/02

Item 113: Scour Critical Bridges: Code I/91

Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site.
_____ Yes __X__ No




SOUNDING PLAN




TYPICAL BRIDGE/DAM SECTION

GENERAL NOTES:

1. The North and South Abutments, and Pier 1 were inspected underwater.
2. At the time of inspection on August 26, 2002, the waterline of the upper pool was located approximately 6.3 feet below the top of the curb at the east end of Pier 1. The waterline of the lower pool was located approximately 19.4 feet below the top of the curb at the west end of Pier 1. These correspond to a upper pool waterline elevation of 98.2, and a lower pool waterline elevation of 85.1 based on previous report dated August 24, 1997.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.
4. Soundings were taken parallel to the bridge at 1/4 point intervals between the substructure units.
5. Refer to Figure 2 for Inspection Notes.

Legend

| | |
|---|---|
| -2.0 | Sounding Depth from Waterline (8/26/02) |
| -5.2 | Sounding Depth from Waterline (8/24/97) |
| (1) | Inspection Note Number |

**MINNESOTA**
**DEPARTMENT OF TRANSPORTATION**
**UNDERWATER BRIDGE INSPECTION**

STRUCTURE NO. 4992
OVER THE CLEARWATER RIVER DAM
DISTRICT 2, CLEARWATER COUNTY

# INSPECTION AND SOUNDING PLAN

| | | |
|---|---|---|
| Drawn By: PRH | COLLINS ENGINEERS, INC. | Date: AUG. 2002 |
| Checked By: MDK | 300 W. WASHINGTON, STE. 600<br>CHICAGO, ILLINOIS 60606<br>(312) 704-9300 | Scale: NTS |
| Code: 35120036 | | Figure No.: 1 |

*INSPECTION NOTES:*

1. *The channel bottom material consisted of sandy gravel with random riprap and up to 2 inches of probe rod penetration.*
2. *The channel bottom material consisted of 6 to 18 inch diameter riprap with no probe rod penetration.*
3. *Failed concrete repair with random map cracking and exposed reinforcing steel from the waterline to 4 feet above the waterline, with 1 inch maximum penetration on the north face of the Pier, and typical 1 to 2 inches and a maximum of 4 inches of penetration on the rest of the Pier and North Abutment.*
4. *Surface delamination in the concrete repair with 1/8 inch of penetration.*
5. *Vertical 1/8 inch crack on both sides of Pier 1 extending from the failed concrete repair to the pier.*
6. *Spalled, cracked, and unsound concrete area centered at the waterline, 2 feet wide by 5 feet high, with exposed aggregate and up to 2 inches maximum penetration.*
7. *Random light concrete scaling of below water concrete surfaces with up to 1/8 inch penetration.*
8. *Vertical 1/16 inch wide crack extending from the footing slab up 8 feet through a failing repair patch with a 6 inch diameter spall 2.5 feet above the waterline.*
9. *Vertical 1/16 inch wide crack extending from the top to the bottom of the wall.*
10. *Vertical 1/16 inch wide crack extending from the top of footing slab up 8 feet through a failing repair patch with 1 foot diameter spall 2 feet above the footing.*
11. *Vertical 1/16 inch wide crack extending up from the top of footing 8 feet and continuing diagonally to the top of the wingwall.*
12. *Vertical 1/8 inch wide crack extending up from the top of footing 8 feet and continuing diagonally to the top of the wingwall.*
13. *Area of minor section loss located at the northeast corner of southeast wingwall with up to 2 inches maximum penetration.*
14. *Area of minor section loss, 6 inches wide by 6 inches high, 3 feet above the top of footing at the southwest corner of northwest wingwall.*
15. *Corner spall, 6 inches wide by 6 inches high, with 1 inch maximum penetration.*
16. *Hairline to 1/16 inch wide crack, located 4 feet from the downstream nose, extending up from the top of failed concrete repair and continuing diagonally to the downstream corner of Pier 1.*
17. *Spall, 6 inches wide by 10 inches high, with 4 inches maximum penetration.*

**MINNESOTA**
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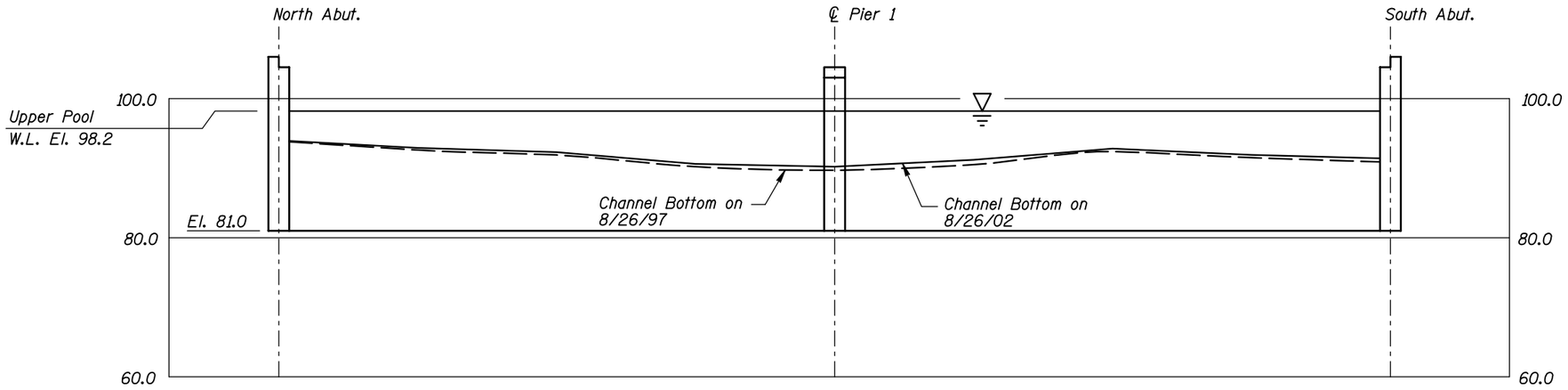
**UNDERWATER BRIDGE INSPECTION**

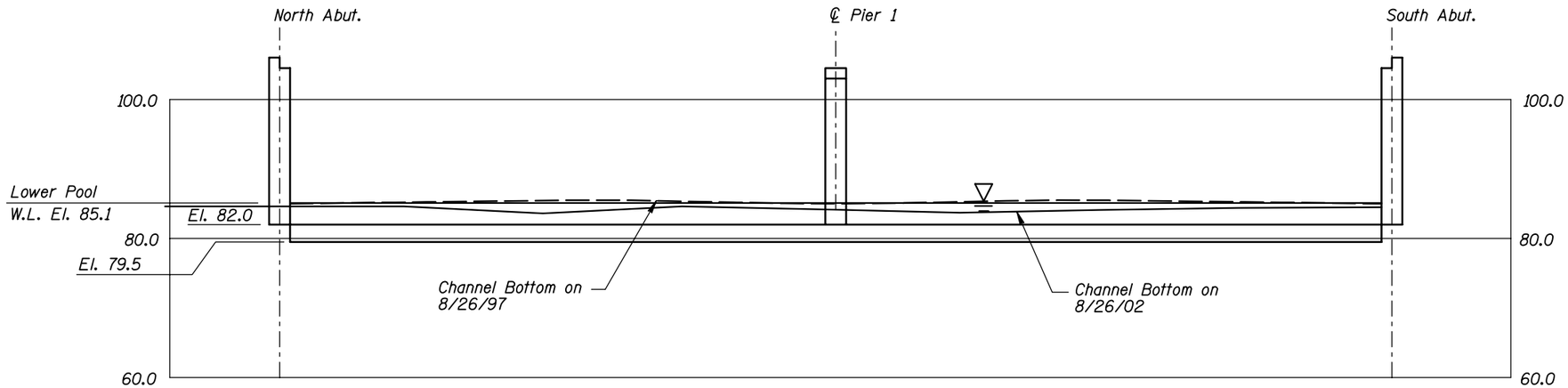
STRUCTURE NO. 4992
OVER THE CLEARWATER RIVER DAM
DISTRICT 2, CLEARWATER COUNTY

# INSPECTION NOTES

| | | |
|---|---|---|
| Drawn By: PRH | **COLLINS ENGINEERS, INC.** | Date: AUG. 2002 |
| Checked By: MDK | 300 W. WASHINGTON, STE. 600<br>CHICAGO, ILLINOIS 60606<br>(312) 704-9300 | Scale: N/A |
| Code: 35120036 | | Figure No.: 2 |




EAST FASCIA PROFILE
Vertical Scale: 1"=20'-0"




WEST FASCIA PROFILE
Vertical Scale: 1"=20'-0"

Note:

Refer to Figure 1 for General Notes.

**MINNESOTA**
**DEPARTMENT OF TRANSPORTATION**
**UNDERWATER BRIDGE INSPECTION**

STRUCTURE NO. 4992
OVER THE CLEARWATER RIVER DAM
DISTRICT 2, CLEARWATER COUNTY

EAST AND WEST FASCIA PROFILES

| | | |
|---|---|---|
| Drawn By: PRH | **COLLINS ENGINEERS, INC.** | Date: AUG. 2002 |
| Checked By: MDK | 300 W. WASHINGTON, STE. 600<br>CHICAGO, ILLINOIS 60606<br>(312) 704-9300 | Scale: NTS (U.O.N.) |
| Code: 35120036 | | Figure No.: 3 |

Photograph 1. Overall View of the Upstream Fascia of the Structure, Looking South.

Photograph 2. View of Pier 1, Looking Southeast.


Photograph 3. View of Overall of the West Wingwall of the South Abutment, Looking Southeast.


Photograph 4. View of Overall of the West Wingwall of the North Abutment, Looking Southeast.

Photograph 5. View of the Spall on the East Wingwall of the South Abutment, Looking Southeast.

Photograph 6. View of the Spall on the West Wingwall of the South Abutment, Looking Southeast.


Photograph 7. View of Concrete Deterioration at the Bottom of the Center Pier, Looking North.


Photograph 8. View of Concrete Deterioration at the Bottom of the Center Pier, Looking East.

Photograph 9. View of Crack in the West Wingwall of the North Abutment, Looking North.

Photograph 10. View of Spall in the West Wingwall of the North Abutment, Looking North.

Photograph 11. View of Concrete Deterioration at the Bottom of the Northwest Wingwall and the bottom of the North Abutment, Looking North.

Photograph 12. View of Exposed Reinforcing Steel at the North Abutment, Looking North.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES
DAILY DIVING REPORT

INSPECTORS: Collins Engineers, Inc. DATE: August 26, 2002
ON-SITE TEAM LEADER: Daniel G. Stromberg, P.E.
BRIDGE NO: 4992 WEATHER: Sunny, " 80° F
WATERWAY CROSSED: The Clearwater River
DIVING OPERATION: X SCUBA SURFACE SUPPLIED AIR
OTHER
PERSONNEL: Michelle D. Koerbel, Matthew J. Lengyel
EQUIPMENT: Scuba, U/W Light, Scraper, Sounding Pole, Lead Line, Probe Rod, Camera
TIME IN WATER: 12:30 P.M.
TIME OUT OF WATER: 1:20 P.M.
WATERWAY DATA: VELOCITY Negligible
VISIBILITY " 3 Feet
DEPTH 8.0 feet maximum upstream of Pier 1.
ELEMENTS INSPECTED: The North and South Abutments and Pier 1.
REMARKS: Overall, the concrete was in satisfactory to fair condition. One 1/8 inch wide crack and one 1/16 inch wide crack was observed on both sides of Pier 1. Two 1/16 inch wide vertical cracks were observed on the North Abutment. Approximately 60 to 80 percent of the concrete patchwork repair on the North Abutment and both sides of Pier 1 has failed with typical penetrations of 1 to 2 inches, maximum penetration of 4 inches, and some exposed reinforcing steel. The concrete patchwork repair on the South Abutment was delaminated with 1/8 inch of penetration. The downstream wingwalls exhibited failure of repair patches with cracks up to 1/8 inch wide and spalls up to 1 foot in diameter with up to 4 inches of penetration.

FURTHER ACTION NEEDED: ___X_____ YES _____ NO

If long-term serviceability is desired for the structure, consideration should be given to removing all unsound concrete repair materials, and restoring the concrete surfaces by patching and recasting with a concrete mix of high durability and low permeability. In addition, the cracks on both sides of Pier 1 and in the wingwalls should be repaired by epoxy injection.

Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

# UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 4992
INSPECTORS Collins Engineers, Inc.
ON-SITE TEAM LEADER Daniel G. Stromberg, P.E. 21491
WATERWAY CROSSED The Clearwater River

INSPECTION DATE August 26,2002

NOTE: USE ALL APPLICABLE CONDITION DEFINITIONS AS DEFINED IN THE MINNESOTA RECORDING AND CODING GUIDE INCLUDING GENERAL, SUBSTRUCTURE, CHANNEL AND PROTECTION, AND CULVERTS AND WALL DEFINITIONS TO COMPLETE THIS FORM.

## CONDITION RATING

| | | | SUBSTRUCTURE | | | | | | CHANNEL | | | | | GENERAL | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNIT REFERENCE NO. | | MAXIMUM DEPTH OF WATER | PILING | COLUMNS, SHAFTS, OR FACES* | FOOTINGS | DISPLACEMENT | OTHER (BRACING) | OVERALL SUBSTRUCTURE CONDITION CODE* | SCOUR | EMBANKMENT EROSION | EMBANKMENT PROTECTION | OTHER (DRIFT/DEBRIS) | OVERALL CHANNEL & PROTECTION CONDITION | CONCRETE | STEEL | TIMBER | LOSS OF SECTION | PREVIOUS REPAIR OR MAINTENANCE | OTHER |
| | UNIT DESCRIPTION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | North Abutment | 0.5’ or 4.3’ | N | 5 | N | 8 | N | 5 | 8 | 7 | 7 | N | 8 | 5 | N | N | 5 | 4 | N |
| | Pier 1 | 0.9’ or 8.0’ | N | 5 | N | 8 | N | 5 | 8 | N | N | N | 8 | 5 | N | N | 5 | 4 | N |
| | South Abutment | 0.6’ or 6.8’ | N | 6 | N | 8 | N | 6 | 8 | 7 | 7 | N | 8 | 5 | N | N | 5 | 4 | N |
| | | | | | | | | | | | | | | | | | | | |

*UNDERWATER PORTION ONLY

REMARKS: Overall, the concrete was in satisfactory to fair condition. One 1/8 inch wide crack and one 1/16 inch wide crack was observed on both sides of Pier 1. Two 1/16 inch wide vertical cracks were observed on the North Abutment. Approximately 60 to 80 percent of the concrete patchwork repair on the North Abutment and both sides of Pier 1 has failed with typical penetrations of 1 to 2 inches, maximum penetration of 4 inches, and some exposed reinforcing steel. The concrete patchwork repair on the South Abutment was delaminated with 1/8 inch of penetration. The downstream wingwalls exhibited failure of repair patches with cracks up to 1/8 inch wide and spalls up to 1 foot in diameter with up to 4 inches of penetration.

NOTES: ATTACH SKETCHES AS NEEDED, IDENTIFY REMARK BY REFERRING TO UNIT REFERENCE NO. AND REMARK NO.
USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.